REMARKS

Claims 1 - 19 remain active in this application. Claim 20 - 25 have previously been canceled. Claims 6 - 19 have been withdrawn from consideration as being non-elected, with traverse, in response to a requirement for election of species. Claims 1, 2 and 4 have been amended to improve clarity. Support for the amendments of the claims is found throughout the application, particularly in Figures 2A, 2B, 4 and 5 and the description thereof in paragraphs 0046 through 0060. No new matter has been introduced into the application. The indication of allowability of claims 3 - 5 is noted with appreciation.

The requirement for election of species and the prior oral election are acknowledged. Species A has been elected and claims 1 - 19, all the claims in the application, rather than only claims 1 - 5 as indicated by the Examijner, are considered to be readable thereon for the reasons more fully discussed below.

It is noted for the record that while the present office action indicates that election was made of Group A (claims 1 - 5), with traverse, the traverse at the time of oral election of species A was only in regard to species D (claim 19). However, in view of the statement of the requirement in the present office action, *the requirement is additionally traversed in its entirety as being incomplete* since the characteristics of the respective species by which they have been determined by the Examiner to be mutually distinct is not stated. The enumeration of the species identifies the respective species only by claim numbers and clearly has omitted any description of the respective identified species. It is respectfully submitted that such an incomplete statement of the requirement is extremely prejudicial to Applicant, particularly where a response to the requirement must

include not only an election of an identified species but an identification of all claims considered to be readable thereon. In this regard, the statement of the requirement also contains an assertion that no generic claim is present; which assertion is also respectfully traversed and respectfully submitted to indicate a lack of understanding of the nature of the invention, as claimed.

In an effort to respond to the requirement as it stands and in the absence of a statement by the Examiner indicating how the identified species are deemed to be mutually distinct, however, it is respectfully pointed out that steps 4 - 7 of Figure 1 are all directed to the determination of the existence of a defect and its location: step 4 provides a mapping of currents in respective identified areas of the chip, step 5 performs an area-to-area comparison of those currents in respective areas, step 6 provides for resolution of the location of a detected defect in respective areas of the chip (in two different ways as will be discussed below) and step 7 provides for isolation of the defect location by, for example, modeling. Thus, all four steps involve determination of location and differ from each other largely in the degree of certainty of the existence and location of a defect each step incrementally produces and are certainly not mutually exclusive but, rather, each step refines the information produced in the preceding step. More importantly, all steps rely, to some degree, on analysis of the relative magnitudes of currents at terminals associated with respective areas, sections, subsections, sub-subsections, etc. which reflect currents in those associated sections of the circuit. In other words, the elected species A and claims 1 - 5 are directed to a method which basically corresponds to step 6 of Figure 1 but which is also basic to steps 4, 5 and 7, as well.

More specifically, the basic thrust of the invention is to improve signal-to-noise ratio of I_{DDQ} defect detection and location by energizing areas or section of a circuit which may be accessed by corresponding terminals and then activating potential I_{DDQ} defects therein and measuring resulting currents on respective terminals. This function is performed in two ways which are usable together and respectively provide a more-or-less indirect determination of I_{DDQ} defect location and a more-or-less direct determination of I_{DDQ} defect location. That is, claim 1 in the elected group does not require division of an area of a circuit as does dependent claim 2 and each of the other independent claims 6, 15 and 19 while still providing location of a defect. Essentially, claim 1 comprehends an indirect determination of defect location by a type of interpolation based on relative current magnitude at respective ones of the terminals corresponding to and bounding an area, section, subsection, etc. as specifically illustrated in Figures 4 and 5 while a more direct form of this same technique may be performed by dividing the area in accordance with the locations of terminals which may intervene between terminals bounding an area but which may therefore bound a smaller section, subsection, sub-subsection, etc. thereof where the relative magnitudes of currents may be directly measured as illustrated in Figures 2A and 2B. The indirect, "interpolative" technique may be performed within any area corresponding to such a section, subsection, sub-subsection, etc. and particularly when the area has been divided to the point that no further terminals intervene between the bounding terminals of an area (e.g. as recited in allowed claim 3). Viewed in another way, particularly in view of the discussion of the direct and indirect techniques and as can be seen from a comparison of Figures 2 and 3A - 3C with Figures 4 and 5, the direct

technique involves a physical division of the area in accordance with available terminals whereas in the indirect technique there is only a conceptual or definitional (e.g. paragraphs 0049, 0050, 0054 and 0057) division of an area.

Both the direct and indirect forms of the defect location technique correspond most directly and fundamentally to step 6 of Figure 1 and are explicitly disclosed as such but are also fundamental to the mapping, current comparison and modeling steps 4, 5 and 7, respectively. It is also respectfully submitted that the direct and indirect location resolution or determination techniques are not mutually exclusive and each can be and preferably is used in connection with the other and to refine the result of the other, as noted in paragraphs 0044+ of the specification. In this sense, claim 1 is of the greatest breadth and is generic to all claims in the application. It is believed significant to note in this regard that claim 2 is, on the record, within the elected, identified species and additionally recites the division of the area and thus claim 1 is generic to claim 2 and it thus logically follows that claim 1 is also generic to claim 6 which claims the division of the areas as well as activating defects and measuring current in or corresponding to respective areas (also recited in claim 1) and claims 15 and 19 which claim basically the same combination of steps and some additional steps involved in mapping or modeling particular defects and thus should also apparently be within the elected species identified by the Examiner. Moreover, in regard to (non-elected) claim 15 which is directed to mapping of I_{DDQ} currents, illustrated at step 4 of Figure 1, it is disclosed at paragraph 0042 that the remainder of steps 5 - 7 of Figure 1 can be performed in a manner to interpret the mapping results and thus claims 6 - 14 and 15 - 18 and the elected species of

claims 1 - 5 are not mutually exclusive and thus are not properly considered to be species at all although they are believed to be patentably distinct. Claim 19 includes steps included within the elected species and includes other patentably distinct recitations specific to modeling and thus claims of the elected species are generic thereto if, indeed, claim 19 can properly be considered to be a species at all. Therefore, it is respectfully submitted that, as nearly as can be determined from the incomplete statement of the requirement for election of species, that all claims 1 - 19 are readable on the elected species and at least elected claim 1 is generic to all claims in the application.

Accordingly, it is respectfully submitted that the identified species do not appear to be species at all since they are not mutually exclusive and the requirement is improper for that reason. Additionally, since the elected species is fundamental to each of steps 4 - 7 of Figure 1 and claims directed to steps other than step 6 include steps recited in the elected claims and claim 1 is generic, there can be no serious burden of examination in the absence of the requirement. Moreover, the requirement for election of species is clearly improper as being incomplete for failing to adequately define the basis for identification of the asserted respective species by the Examiner. Further, the requirement is improper for failing to demonstrate that the species are mutually distinct or that the claims present an undue burden of examination in the absence of such a requirement in order to justify insistence upon the requirement. Accordingly, it is respectfully requested that the requirement for election of species be reconsidered and withdrawn at least with respect to claim 19, as to which the oral election was initially made with traverse, and also with respect to claims 6 - 14 and 15

- 19 which clearly correspond to the elected species, as demonstrated above. In any case, it is respectfully submitted that the requirement cannot stand without being completed on the official record of this application and at least completion of the statement of the requirement is respectfully requested.

Claims 1 - 2 have been rejected under 35 U.S.C. §103 as being unpatentable over Miller in view of Gattiker et al. This ground of rejection is respectfully traversed, particularly since the statement of this ground of rejection does not address the actual recitations of the claims included therein and is not, in fact, supported by the teachings, suggestions or evidence of the level of ordinary skill in the art contained in the references relied upon by the Examiner.

Miller is directed to improving I_{DDQ} testing in the presence of background noise and is thus relevant to the invention. However, references therein to "delta I_{DDQ}" testing refer to a technique much different from the type of testing referred to by the same term in paragraph 0043 of the present invention. In the present invention, the delta I_{DDQ} is developed between different groups of pins defining respective areas or sections, etc. while the delta I_{DDQ} of Miller refers to differences in I_{DDQ} for the entire integrated circuit or an individual potential defect site but distinguished by biased and unbiased conditions of particular locations where defects may be anticipated. This distinction is particularly evident from Figures 4a and 4b, the discussion thereof at column 4, line 29, to column 5, line 21, and the definition of biased and unbiased at column 3, lines 34 - 43. This process corresponds generally to only the activation of defects and, in fact, Miller explicitly uses that terminology in regard thereto at column 5, line 8. Such testing must be performed iteratively and exhaustively over all

potential defect sites which largely defeats the potential of I_{DDQ} for screening of areas of circuits or entire circuits for defects (see paragraph 0003 of the present specification). Thus there is no teaching or suggestion of screening areas for defects or determination of defect location by measurement of current at particular respective terminals bounding various areas or sections of the integrated circuit as claimed but only determination of location of a defect at a potential defect site by activation thereof and comparison with the deactivated defect I_{DDQ} to allow a comparison which potentially reduces the effects of background noise (since the background noise current will presumably be the same whether the defect is activated or not) by comparison of current with and without activation of a defect but which becomes increasingly marginal with increasing background noise current as circuits such as integrated circuits contain increasing numbers of devices.

In sharp contrast, the invention provides for screening of respective areas or sections of circuits for defects at an improved signal-to-noise ratio and *resolution* of the location of defects *after or concurrently with their discovery* by measurement of relative amounts of I_{DDQ} at terminals bounding an area as recited in claim 1 and the division and re-division of areas of a circuit as recited in claim 2 (and allowed claim 3) while directly reducing the number of contributions to background noise current by testing smaller respective portions of the integrated circuit area.

It appears that the Examiner at least partially appreciates this distinction (although the Examiner appears to gloss over actual claim recitations by discussing the inherency of the existence of terminals on the device under test in Miller) by admitting that Miller is silent in regard to location of defects and

it is literally true that Miller does not provide any screening for defects and resolving the location of those defects once found, as achieved by the invention, or teach or, for that matter, suggest location of a defect with any more resolution than provided by the activation in order to discover the defect. The Examiner then relies upon column 1, lines 49 - 53, of Gattiker et al. for teaching subject matter only generally approaching the mere concept of locating a defect. Specifically, the passage of Gattiker et al. cited by the Examiner is specific to the location of defects by comparison of current signatures to the current signatures of defective integrated circuits where the location(s) of respective defects are known. This is far different from the actual *locating* or *resolving the location* of a discovered defect in a circuit based on relative I_{DDQ} currents at respective terminals bounding an area of the circuit as claimed in claim 1 or where the background noise current is reduced by division of an area as recited in claim 2.

This distinction supports a very important and significant meritorious effect of the present invention which is not remotely approached by the combination of Miller and Gattiker et al. since the invention allows improvement of the reliability of *screening* for and detection of defects and resolution of the location of any defect so detected by testing portions of the integrated circuit or other circuit, itself, while the combination of Miller and Gattiker et al., at best, require iterative and exhaustive testing of all potential locations of defects and provide location of defects only by comparison with nominally identical but defective circuits in which the current signatures are known for defects at particular locations therein. It should be noted in this regard that Gattiker et al., provides no greater resolution of the location of a defect than does Miller since Miller tests all

potential locations and does not further resolve the location as the Examiner admits and Gattiker et al. merely compares current signatures to infer a location of a defect corresponding to a location iteratively tested by Miller. In other words, the current signatures of Gattiker et al. substantially correspond to the collective pattern of iterative location activation and deactivation of Miller over all potential defect sites.

Therefore, it is abundantly clear that the references relied upon do not, in fact, answer the recitations of claims 1 and 2 either as originally filed or as clarified by the above amendment. By the same token, it is respectfully submitted that the Examiner has not made and cannot make a *prima facie* demonstration of the obviousness of any claim in the application based on the teachings, suggestions and evidence of ordinary skill in the art provided by the references relied upon which clearly do not lead to an expectation of success in achieving the meritorious effects of the invention, particularly in the manner claimed (based on relative magnitude of I_{DDQ} at respective bounding pins and/or improvement of detection by improving signal to noise ratio through testing of divided portions of a circuit). There is no teaching, suggestion or motivation for modification of known devices to answer the explicit recitations of the claims and the Examiner has not made such a demonstration based on any such teaching and/or logical line of reasoning based thereon.

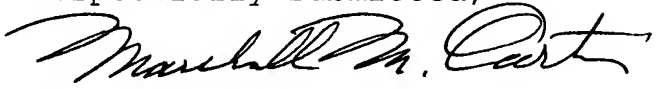
Accordingly, it is respectfully submitted that the sole ground of rejection in this application is clearly in error and untenable. The combined teachings of the applied references do not lead to an expectation of success in providing the improved I_{DDQ} testing in a rapidly performed screening at improved signal-to-noise ratio in connection with rapidly performed resolution

and isolation of defect locations, particularly by the particular combination of steps recited in the claims which the Examiner does not directly address. Therefore, upon reconsideration, withdrawal of the rejection of claims 1 and 2 is respectfully requested.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account No. 09-0456 of International Business Machines Corporation (Burlington)

Respectfully submitted,



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